FINAL CONSTRUCTION INSPECTION REPORT
SOIL VAPOR EXTRACTION

CARRIER COLLIERVILLE SITE
MAIN PLANT AREA

PROJECT NUMBER: 1048—047

Prepared for:

Carrier Corporation
97 South Byhalia Road
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1.0 INTRODUCTION

On June 1, 1995, United States Environmental Protection Agency (USEPA), Carrier Corporation, and Environmental and Safety Designs, Inc. (EnSafe) representatives met at the Carrier Collierville Site for the purpose of conducting the Final Site Inspection of the SVE treatment system at the MPA. USEPA was represented by Ms. Beth Brown (Remedial Project Manager). Present for Carrier were Mr. Nelson Wong (Carrier, Syracuse, NY) and Mr. Carl Krull (Carrier, Collierville, Tennessee). EnSafe was represented by Mr. Craig Wise (Project Manager) and Mr. Darrell Richardson (Project Engineer). As part of the inspection, a checklist was completed which documents all data gathered during the inspection, this checklist is provided as Appendix A.

In accordance with the requirements of Task III — Remedial Action of the Carrier Collierville Scope of Work (SOW), this Final Construction Inspection Report has been submitted within 14 days of the Final Site Inspection and provides documentation that all relevant requirements of the Carrier Collierville Site, SOW, and Record of Decision (ROD) have been completed. In addition, this report is intended to document that the selected site remedy is fully functional, operating, and meets the requirements of the design plans and specifications.

2.0 BACKGROUND

The remedial objective of the SVE treatment system is to remediate vadose zone soil contaminated above the ROD stipulated cleanup criterion of 533 micrograms per kilogram (μg/kg) trichloroethene (TCE). A series of 6 vacuum extraction wells have been installed that are screened from just below the ground surface to 20 feet below ground surface (bgs), and one vacuum extraction well screened from 30 to 40 feet bgs which was installed for the treatability

study, but is not necessary for remediation. The applied vacuum is designed to strip sorbed VOCs from the underlying soils, pull the VOC contaminated air through 2 carbon units, and discharge clean air to the atmosphere.

3.0 SUMMARY OF CONSTRUCTION ACTIVITIES

The construction work developed for the MPA SVE system included: the Sitework Contract for installing underground piping and constructing the concrete pad over the underground system; the Well Installation Contract for the SVE wells; and the Treatment System Installation Contract. EnSafe provided the necessary construction management and field oversight.

The Well Installation Contract was awarded to Tri-State Testing and Drilling of Memphis, Tennessee. Tri-State mobilized to the Site on May 17, 1994, and began installing the 4 additional shallow SVE wells (2 of the SVE wells were previously installed for treatability testing). Other areas at the Carrier Collierville Site were also investigated as possible areas for SVE treatment during this period, but were found to be below the 533 μg/kg cleanup criterion. Work on the SVE wells was completed on May 23, 1994.

The Sitework Contract was awarded to G & H Construction Company of Collierville, Tennessee. G & H mobilized to the Site on October 1, 1994 and, over the next 12 days conducted the required clearing of asphalt and trenching of underlying soils to provide the main trench run for the shallow and deep SVE well manifolds. SVE well vaults were also constructed and underground piping connected to the vaults and run through the trenches to the proposed equipment compound location. After final grading of the remediation area, a 10-inch thick concrete pad was installed over the area.

The Treatment System Installation Contract was awarded to G & H Construction Company of Collierville, Tennessee. G & H subcontracted the installation work to Metro Mechanical Construction (Metro) of Memphis, Tennessee. Metro mobilized to the site on January 4, 1995 and immediately began placing the equipment in the equipment compound per design drawings. Metro was responsible for installation of all treatment equipment as well as tying in the pre-existing undergound manifold lines to the treatment system. At the time of the Final Site Inspection, Metro had completed all contract requirements as well as punch-list items discovered during the Pre-Final Construction Inspection.

4.0 COMPLETION OF PRE-FINAL INSPECTION PUNCH-LIST ITEMS

On February 23, 1995, USEPA, Carrier, EnSafe, and Tennessee Department of Environment and Conservation (TDEC) representatives met at the Site for the purpose of conducting the Pre-Final Site Inspection of the MPA SVE system. As required by the SOW, EnSafe prepared and submitted a Pre-Final Inspection Report, that included a construction completeness punch-list for all outstanding construction items (reference Appendix B). The USEPA also prepared a check-list to be completed prior to the Final Inspection. This checklist, submitted as part of the Pre-Final Construction Inspection Report, served as the basis for verifying the operational capability of the MPA SVE system during the Final Construction Inspection.

Carrier and EnSafe have since addressed all construction items identified as incomplete prior to the Final Construction Inspection.

5.0 SUMMARY OF DESIGN MODIFICATIONS

The following discussion provides a description of design modifications and changes that will be implemented during operation of the SVE system. These changes are a result of discussions between attendees during the Final Construction Inspection. These changes and modifications will be made to improve the operation of the treatment system and in response to site conditions, and will not alter the overall treatment process or remedial objectives set forth in the approved plans and specifications.

- Monitoring probe (MP) identification will be stenciled onto the concrete pads surrounding the covers.
- Flow direction arrows will be placed on the piping system in the compound.
- Drain water from MP-8B.
- A sampling port septum will be installed in the deep well manifold at the equipment compound.
- Pressure tap quick-connect fittings will be installed at each wellhead to enable use of the SVE wells as additional monitoring points.
- EnSafe will train Carrier Collierville staff the basic operation of the system.

6.0 FINAL CONSTRUCTION INSPECTION

The final inspection began with closing the dilution valve (V-DIL) to operate the vacuum blower at approximately 120 inches water column (WC). All, and only shallow vertical SVE wells were fully open, the deep SVE well (1-B) was closed. During operation under these conditions, wellhead flowrates were obtained and recorded on a blank checklist, from each shallow well. Wellhead flowrates averaged 4 cubic feet per minute (cfm) with high flowrates to 8 cfm. The unsteady flowrate reading was probably due to each wellhead gate valve located approximately 1 foot from the flowrate port, resulting in a disturbed air flow. Vapor samples from each wellhead were also taken and injected into 20 milliliter (ml), evacuated bottles for analysis by Target Laboratories. Additional sample volume was taken for field analysis with a photoionization detector (PID). PID readings recorded from the shallow wells were:

SVE-2A	200	ppm
SVE-2B	85	ppm
SVE-2C	160	ppm
SVE-2D	52	ppm
SVE-2E	190	ppm
SVE-2F	250	ppm

Vapor samples were also taken before carbon, after carbon vessel #1, and after carbon vessel #2 while the system was running with only shallow wells open. Laboratory analytical data of all vapor samples is included in the Final Construction Inspection Checklist (Appendix A). Samples are identified as follows:

2A...2F, 1B	indicates SVE well where sample was taken
BC	indicates sample taken before carbon vessel #1

AC1	indicates sample taken after carbon vessel #1
AC	indicates sample taken after carbon vessel #2
time	time of sample follows each identifier

After completion of the above, the MPs were measured using a handheld digital manometer equipped with a 1-inch slip cap to seal around the MP casing. The manometer was allowed to stabilize, and the result recorded on the checklist. In lieu of measuring MP-4B, shallow well SVE-2A was isolated from the rest of the system and a pressure tap installed at the sampling port location to measure influence from adjacent open SVE wells (all shallow SVE wells are installed on 20 foot centers). Manifold pressure was maintained at 120 inches WC. The highest reading was recorded at MP-6B which registered 6.9 inches WC. The deep MPs measured the following; MP-7B: 2.1 inches WC, MP-3B: 1.7 inches WC. The remaining two shallow MPs were not measured, therefore, SVE-2A was isolated and a vacuum reading of 3.4 inches WC recorded after stabilization.

Following completion of recording MP data, the system was switched to deep well and shallow well operation. The manifold pressure was maintained at 120 inches WC. The system was allowed to run in this mode for approximately 75 minutes, at which time SVE-2A was shut off so it could be used as a MP. The initial pressure reading in SVE-2A was 8.9 inches of water. SVE-1B (deep MP) was then shut off and the pressure monitored in SVE-2A to determine if there is a vertical pressure gradient between the shallow wells and the deep well. The pressure in SVE-2A dropped to 5.8 after 15 minutes. It was concluded that the drop in pressure at SVE-2A after closing SVE-1B was not due to shutting in of SVE-1B, but due to vacuum still present at SVE-2A after it was isolated.

All shallow SVE wells were then closed off by the manifold valve (V-SH) at the compound which allowed for a flowrate reading of 24 cfm at SVE-1B. A vapor sample was also taken at

SVE-1B, and a PID reading of 270 ppm was also recorded. Deep MPs were then measured with only the deep well in operation. Results were; MP-7B: 3.4 inches WC, MP-3B: 2.4 inches WC.

The last test of the day was to test the sphere of influence at the shallow wells. This was accomplished by shutting in all of the shallow wells and deep well at the wellhead with the exception of SVE-2F. The pressure at the blower was then readjusted to 120 inches WC and vacuum response was measured at the remaining wells. MP-6B, which is approximately 44 feet east of SVE-2F, was used as the first point to be monitored. Initially the pressure dropped from 6.1 to 5.1 inches WC. MP-6B was then capped, and SVE-2C was used as the next monitoring point (located approximately 10 feet east of MP-6B). Initially, the manometer registered 4.0 inches WC and dropped to 3.8 after 5 minutes. Any vacuum built up in this well was released by disconnecting the pressure port and opening to atmosphere and allowing the well to stabilize and then reconnecting the manometer. After reconnecting the manometer, the vacuum rebounded to 3.5 inches WC. This test confirmed that the sphere of influence in the shallow SVE wells is in excess of the design sphere of influence of 20 feet (radius).

All testing and data discussed above is tabulated in the Final Checklist (Appendix A).

A site remediation map follows this report, depicting locations of all SVE vertical wells and MPs.

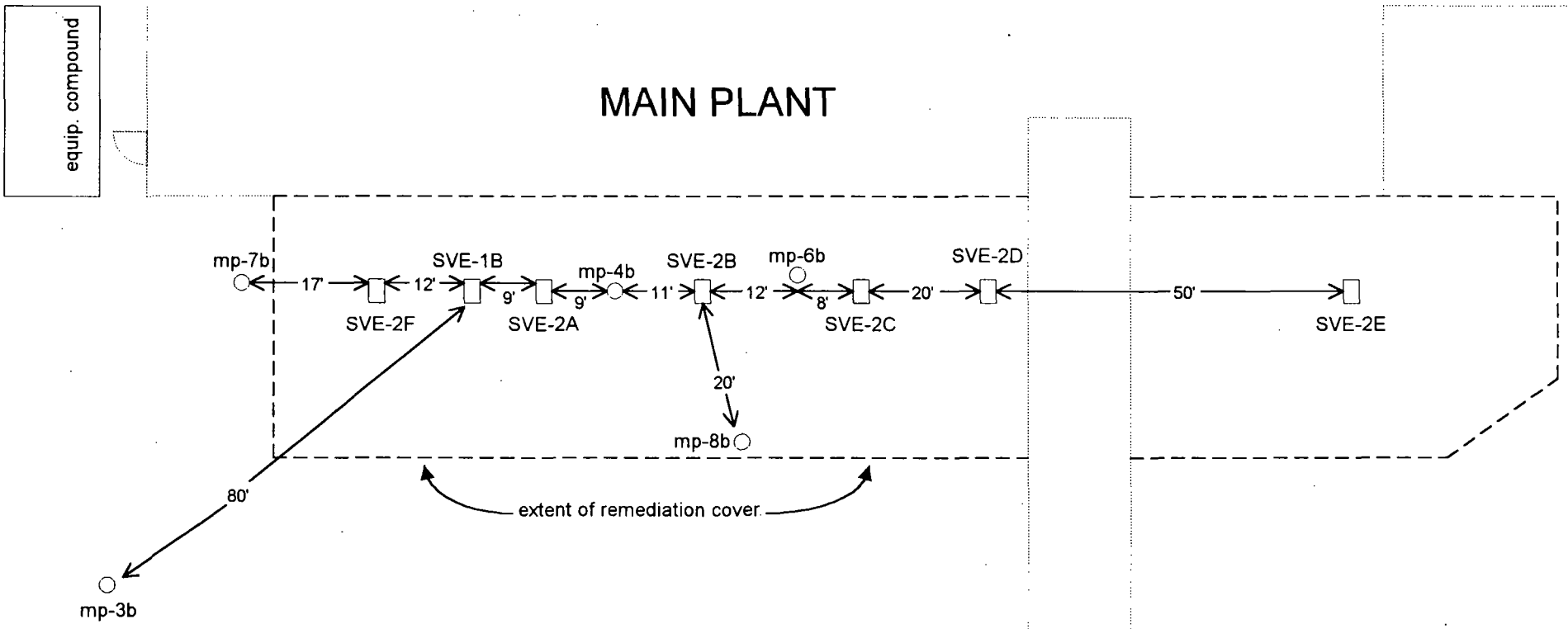
7.0 IMPLEMENTATION OF SITE REMEDY

After completion of the Final Construction Inspection the system was left running at 120 inches WC at the blower with only the shallow SVE wells in operation.

Start-up activities and routine site operations and maintenance activities have been previously described in the *Operation and Maintenance Plan — Soil Vapor Extraction, Carrier Collierville Site Main Plant Area*. This document has been submitted to the USEPA for review.

8.0 SITE CONSTRUCTION PHOTOGRAPHS

A series of site photographs documenting the progress of construction activities during the Remedial Action is presented in Appendix C. Captions are provided with each photograph to describe the significance of the activities depicted.



Vertical SVE Wells

APPENDIX A

FINAL CONSTRUCTION INSPECTION CHECKLIST

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION-FINAL
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: 6/1/95 Inspector(s) Beth Brown-USEPA

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment/informatio such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attachments to t checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status
		EQUIPMENT			
06/01		Emission Stack			
06/01	1113	Temperature Indicator	TI-1	range:0-220 deg F	168 deg F
06/01		Regenerative Blower		Rotron DR1223BH72	Operational
06/01		Electric Motor		20-hp,3530 rpm (60 Hz)	Operational
06/01		Control System		auto/manual override	ok
06/01		Vacuum Relief Valve		auto-vac break at 170 in. H2O	system not tested at 170 in. water
06/01		Air Inlet Valve	V-DIL	2-in ball valve	operational
06/01	1114	Vacuum Gauge	PI-5	range:0-160 in H2O	122 in. water
06/01	1114	Particulate Filter		Rotron 516465	operational
06/01	1115	Vacuum Gauge	PI-4	range:0-160 in H2O	117 in. water
06/01	1217	Sample Port	SP-AC	after both carbon units	**see "Analytical Data for Checklist"**
06/01		Activated Carbon Unit #2		capacity: 2,000 lb 4x10	operational
06/01	1116	Vacuum Gauge	PI-3	range:0-160 in H2O	122 in. water
06/01	1210	Sample Port	SP-AC1	after carbon unit #1	**see "Analytical Data for Checklist"**
06/01		Activated Carbon Unit #1		capacity: 2,000 lb 4x10	operational
06/01	1116	Vacuum Gauge	PI-2	range:0-160 in H2O	115 in. water
06/01	1116	Temperature Indicator	TI-2	range:0-220 deg F	98 deg F
06/01	1117	Electric Heater		4 KW, max T=100 deg F	operational
06/01		Controls		max:100 deg F, therm:95 deg F	thermostat set at 95 deg F
06/01		Flow Meter	FI-1	range:10-100 cfm	**see "Flowrate Data for Checklist"**

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Date	Time	Inspected Item	I.D.	Specifications	Status
06/01	1117	Vacuum Gauge	PI-1	range:0-160 in H2O	120 in. water
06/01	1207	Sample Port	SP-BC	before carbon units	**see "Analytical Data for Checklist"**
06/01		Moisture Separator		Rotron MS500, 40-gal cap.	operational
06/01		Water Level Indicator		local:Flotec, pnl:high level alarm	operational
06/01		Drain Valve	V-MSD		operational
		MANIFOLD LINES			
06/01	1102	Shallow Manifold	V-SH	4-in ball valve	operational
06/01	1112	Vacuum		quick conn., range:0-40 in H2O	95 in. water
06/01	1102	Deep Manifold	V-DP	4-in ball valve	operational
06/01		Vacuum		quick conn., range:0-40 in H2O	95 in. water
		HORIZONTAL LINES			
		Horizontal 1			
06/01		Valve	V-H1A	4-in ball valve	
06/01		Valve	V-H1B	2-in gate valve	
06/01		Vacuum		quick conn., range:0-40 in H2O	
06/01		Sample Port	SP-H1		
06/01		Flow Measurement	FI-1		
		Horizontal 2			
06/01		Valve	V-H2A	4-in ball valve	
06/01		Valve	V-H2B	2-in gate valve	
06/01		Vacuum		quick conn., range:0-40 in H2O	
06/01		Sample Port	SP-H2		
06/01		Flow Measurement	FI-1		
		SHALLOW WELLS			

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Date	Time	Inspected Item	I.D.	Specifications	Status
06/01		Shallow Extraction Well	SVE-2F		
06/01		Valve	V-2F	2-in gate valve	operational
06/01		Sample Port	SP-2F		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2A		
06/01		Valve	V-2A	2-in gate valve	operational
06/01		Sample Port	SP-2A		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2B		
06/01		Valve	V-2B	2-in gate valve	operational
06/01		Sample Port	SP-2B		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2C		
06/01		Valve	V-2C	2-in gate valve	operational
06/01		Sample Port	SP-2C		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2D		
06/01		Valve	V-2D	2-in gate valve	operational
06/01		Sample Port	SP-2D		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2E		
06/01		Valve	V-2E	2-in gate valve	operational
06/01		Sample Port	SP-2E		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		DEEP WELL			

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Date	Time	Inspected Item	I.D.	Specifications	Status
		Deep Extraction Well	SVE-1B		
06/01		Valve	V-1B	2-in gate valve	operational
06/01		Sample Port	SP-1B		**see "Analytical Data for Checklist"**
06/01		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		MONITORING WELLS			
06/01		Monitoring Probe	MP-7B	Deep monitoring probe	
06/01		Pressure monitoring		quick conn., range:0-40 in H2O	**see "Mon. Probe Data for Checklist"**
06/01		Monitoring Probe	MP-4B	Shallow monitoring probe	
06/01		Pressure monitoring		quick conn., range:0-40 in H2O	**see "Mon. Probe Data for Checklist"**
06/01		Monitoring Probe	MP-6B	Shallow monitoring probe	
06/01		Pressure monitoring		quick conn., range:0-40 in H2O	**see "Mon. Probe Data for Checklist"**
06/01		Monitoring Probe	MP-8B	Shallow monitoring probe	
06/01		Pressure monitoring		quick conn., range:0-40 in H2O	**see "Mon. Probe Data for Checklist"**
06/01		Monitoring Probe	MP-3B	Deep monitoring probe	
06/01		Pressure monitoring		quick conn., range:0-40 in H2O	**see "Mon. Probe Data for Checklist"**
		CONTROL PANEL			
06/01		Control Panel	CP	NEMA 4 panel	operational
06/01		SVE Blower		Hand/Off/Auto Operation	operational
06/01		Moisture Separator		High Level Alarm	operational
06/01		Timer		24-hr operational	not tested

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Date	Time	Inspected Item	I.D.	Specifications	Status

Flowrate Data for Checklist

Carrier MPA SVE

Operating Modes: 1=only shallow wells open, 2=only deep well open

Operating Mode #	Well I.D	Date	Time of Day	Wellhead Flowrate (acfm)	Wellhead Flowrate (scfm)	Flowrates taken at the conditions shown below: FI-1 (cfm)	PI-1 (in H2O)	PI-2 (in H2O)	PI-3 (in H2O)	PI-4 (in H2O)	PI-5 (in H2O)	Manif. (in H2O)	TI-1 (deg F)	TI-2 (deg F)
1	2A	06/01/95	1058	**4.0**	**4.20**	10.0	120	115	122	117	122	95	168	98
1	2B	06/01/95	1100	**4.0**	**4.20**	10.0	120	115	122	117	122	95	168	98
1	2C	06/01/95	1102	**4.0**	**4.20**	10.0	120	115	122	117	122	95	168	98
1	2D	06/01/95	1104	**4.3**	**4.52**	10.0	120	115	122	117	122	95	168	98
1	2E	06/01/95	1110	**5.0**	**5.25**	10.0	120	115	122	117	122	95	168	98
1	2F	06/01/95	1055	**4.0**	**4.20**	10.0	120	115	122	117	122	95	168	98
2	1B	06/01/95	1520	**24.0**	**26.38**	35.0	120	115	122	117	122	95	168	98

Analytical Data ... r Checklist

Carrier MPA SVE

Operating Modes: 1=only shallow wells open, 2=only deep well open

Operating Mode #	Manifold/ Well I.D.	Date	Time of Day	Sample I.D.	PID Reading (ppm)	Analyte Concentrations via GC/ECD (ug/l unless otherwise noted) 11DCE	CH2C12	t12DCE	11DCA	c12DCE	CHC13	111TCA	CC14	TCE	TCE* (ppm v/v)	112TCA	PCE
1	2A	06/01/95	1142	2A1142	200	17	<1.0	44	<1.0	789	3.6	<1.0	<1.0	**17,800**	**3305.6**	<1.0	8.2
1	2B	06/01/95	1146	2B1146	85	23	<1.0	52	<1.0	1130	4.1	1.1	<1.0	**24,100**	**4475.6**	<1.0	11
1	2C	06/01/95	1153	2C1153	160	23	<1.0	37	<1.0	1,390	4.3	1.2	<1.0	**21,200**	**3937.1**	<1.0	11
1	2D	06/01/95	1156	2D1156	52	5.6	<1.0	6.1	<1.0	313	<1.0	<1.0	<1.0	**738**	**137.1**	<1.0	<1.0
1	2E	06/01/95	1200	2E1200	190	11	<1.0	4.8	<1.0	366	1.2	<1.0	<1.0	**2,540**	**471.7**	<1.0	<1.0
1	2F	06/01/95	1134	2F1134	250	14	<1.0	18	<1.0	1,015	<1.0	<1.0	<1.0	**5,290**	**982.4**	<1.0	3.4
2	1B	06/01/95	1512	1B1512	270	7.1	<1.0	7.7	<1.0	145	2.2	<1.0	<1.0	**5,430**	**1008.4**	<1.0	346
1	shallow/before carbon#1	06/01/95	1209	SBC1209	200	18	<1.0	32	<1.0	1,012	2.8	<1.0	<1.0	**13,100**	**2432.8**	<1.0	7.2
1	shallow/after carbon#1	06/01/95	1213	SAC11213	4	<1.0	<1.0	<1.0	<1.0	3	<1.0	<1.0	<1.0	**18**	**3.3**	<1.0	<1.0
1	shallow/after carbon#2	06/01/95	1217	SAC21217	0.8	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	**9.5**	**1.8**	<1.0	<1.0

*** TCE (ppm v/v) reported at 25 deg C and 1 atmosphere.**

This analytical data is still being reviewed, due to poor recovery on QC sample (TCE spike) sent to lab. Spike sample contained a gas standard containing 107 ppm TCE--reported result was 27 ppm.

Sample Designation:

Line Location:		Process Location:		Time:	
2a..2f	shallow wells	BC	before carbon	i.e. 1430	2:30 pm
1b	deep well	AC1	after carbon #1		
S	shallow manifold	AC	after all carbon		
D	deep manifold				

Monitoring Probe Data for Checklist

Carrier MPA SVE

Operating Modes: 0=system off (background), 1=shallow wells only, 2=deep well only, 3=deep/shallow wells combine 4=all wells (deep/shallow) closed except SVE-2F, remaining wells fitted with a pressure connection and monitored.

Operating Mode #	Monitoring Probe I.D.	Date	Time of Day	Vacuum Response (in H2O)	Pressures taken at conditions shown below: PI-1 (in H2O)	PI-2 (in H2O)	PI-3 (in H2O)	PI-4 (in H2O)	PI-5 (in H2O)
0	4	5/30/95	900	0	0	0	0	0	0
0	6	5/30/95	905	1.2	0	0	0	0	0
0	7	5/30/95	908	0.9	0	0	0	0	0
0	8	5/30/95	909	-	0	0	0	0	0
0	3	5/30/95	915	0.8	0	0	0	0	0
1	4	6/01/95	1225	0	120	115	122	117	122
1	6	6/01/95	1230	6.9	120	115	122	117	122
1	7	6/01/95	1220	2.1	120	115	122	117	122
1	8	6/01/95	-	-	120	115	122	117	122
1	3	6/01/95	1250	1.7	120	115	122	117	122
1	2A*	6/01/95	1237	3.4	120	115	122	117	122
2	4	6/01/95	-	-	120	115	122	117	122
2	6	6/01/95	-	-	120	115	122	117	122
2	7	6/01/95	1246	3.4	120	115	122	117	122
2	8	6/01/95	-	-	120	115	122	117	122
2	3	6/01/95	1250	2.4	120	115	122	117	122
3	4	6/01/95	-	-	120	115	122	117	122
3	6	6/01/95	1521	6.9	120	115	122	117	122
3	7	6/01/95	1434	6.5	120	115	122	117	122
3	8	6/01/95	-	-	120	115	122	117	122
3	3	6/01/95	1440	4.5	120	115	122	117	122

* In lieu of using MP-4B, SVE-2A was isolated and fitted with a pressure connection to be used as a monitoring probe. 20 feet from SVE-2F and 20 feet from SVE-2B.

4	6	6/01/95	1529	6.1	120	115	122	117	122
4	6	6/01/95	1535	5.1	120	115	122	117	122
4	SVE-2C	6/01/95	1537	4.0	120	115	122	117	122
4	SVE-2C	6/01/95	1539	3.9	120	115	122	117	122
4	SVE-2C	6/01/95	1542	3.8	120	115	122	117	122

At 1545, SVE-2C was allowed to stabilize w/atmosphere after which the manometer was reconnected. After reconnecting the manometer, SVE-2C registered a vacuum of 3.5 in water.

Mass Removal Rates for Checklist - TCE

Carrier MPA SVE

Operating Mode #	Manifold/ Well I.D.	Sample I.D.	Date	Flowrate (cfm)	TCE Concentration (ug/l)	Removal (lb/day)
1	2A	2A1142	06/01/95	4.0	17,800	6.391
1	2B	2B1146	06/01/95	4.0	24,100	8.653
1	2C	2C1153	06/01/95	4.0	21,200	7.612
1	2D	2D1156	06/01/95	4.3	738	0.285
1	2E	2E1200	06/01/95	5.0	2,540	1.140
1	2F	2F1134	06/01/95	4.0	5,290	1.899
1	1B	1B1512	06/01/95	24.0	5,430	11.698
1	shallow before carbon #1	SBC1209	06/01/95	10.0	13,100	11.759

eqn. used: (ug/l) (1E-6 g/ug) (ft^3/min) (60 min/hr) (24 hr/day) (28.3 l/ft ^3) (lb/454 g) = lb/day

TARGET LABORATORIES, INC.

FAX

FAX NO. 901-372-2454
EAII011L PO 1048-061

TO: Darrell Richardson

COMPANY: ENSAFE

DATE: June 12, 1995

FROM: Elizabeth J. Tierney, Laboratory Director

SUBJECT: ATTACHED ARE THE ANALYTICAL PROCEDURES, THE DATA TABLE AND THE CHAIN OF CUSTODY FOR THE VAPOR ANALYSIS. A HARD COPY WILL BE MAILED TO YOU TODAY.

PAGES: THIS PAGE PLUS 3

9180 RUMSEY ROAD, COLUMBIA, MARYLAND 21045 (410) 992-6622 Fax (410) 992-0347

ANALYTICAL PROCEDURES

Samples were analyzed on a gas chromatograph equipped with an electron capture detector (ECD) using direct injection. Specific analytes standardized for the ECD analysis were:

1,1-dichloroethene (1,1-DCE)
methylene chloride
trans-1,2-dichloroethene (t-1,2-DCE)
chloroform
1,1-dichloroethane (1,1-DCA)
carbon tetrachloride
cis-1,2-dichloroethene (c-1,2-DCE)
1,1,1-trichloroethane (1,1,1-TCA)
trichloroethene (TCE)
1,1,2-trichloroethane (1,1,2-TCA)
tetrachloroethene (PCE)

The ECD stock standard was purchased from Scott Specialty Gases (Plumsteadville, PA). The concentration of the standard is certified by Scott and is traceable to weights certified by the State of Pennsylvania.

The analytical equipment was calibrated using an instrument-response curve and injection of known concentrations of the above standards. Retention times of the standards were used to identify the peaks in the chromatograms of the field samples and their response factors were used to calculate the analyte concentrations.

The tabulated results of the laboratory analysis of the soil gas samples are reported in micrograms per liter (µg/l) in Table 1. Although "micrograms per liter" is equivalent to "parts per billion (v/v)" in water analyses, they are not equivalent in gas analyses, due to the difference in the mass of equal volumes of water and gas matrices.

For QA/QC purposes, a duplicate analysis was performed on every tenth field sample. Laboratory blanks of nitrogen gas (99.999%) were also analyzed after every tenth field sample.

TARGET Project EAH0111

TABLE 1

ANALYTE CONCENTRATIONS VIA GC/ECD (µg/l)

SAMPLE	11DCE*	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4*	TCE	112TCA	PCE
REPORTING LIMIT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1B-1512	7.1	<1.0	7.7	<1.0	145	2.2	<1.0	<1.0	5,430	<1.0	346
2A-1142	17	<1.0	44	<1.0	789	3.6	<1.0	<1.0	17,800	<1.0	8.2
2B-1146	23	<1.0	52	<1.0	1,130	4.1	1.1	<1.0	24,100	<1.0	11
2C-1153	23	<1.0	37	<1.0	1,390	4.3	1.2	<1.0	21,200	<1.0	11
2D-1156	5.6	<1.0	6.1	<1.0	313	<1.0	<1.0	<1.0	738	<1.0	<1.0
2E-1200	11	<1.0	4.8	<1.0	366	1.2	<1.0	<1.0	2,540	<1.0	<1.0
2F-1134	14	<1.0	18	<1.0	1,015	<1.0	<1.0	<1.0	5,290	<1.0	3.4
BLANK	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
EXB	<1.0	<1.0	<1.0	<1.0	1.9	<1.0	<1.0	<1.0	149	<1.0	<1.0
SAC-1217	<1.0	<1.0	<1.0	<1.0	1.3	<1.0	<1.0	<1.0	9.5	<1.0	<1.0
SAC1-1213	<1.0	<1.0	<1.0	<1.0	3.0	<1.0	<1.0	<1.0	18	<1.0	<1.0
SBC-1209	18	<1.0	32	<1.0	1,012	2.8	<1.0	<1.0	13,100	<1.0	7.2
LABORATORY DUPLICATE ANALYSIS											
BLANK	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BLANK R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LABORATORY BLANKS											
BLANK B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

11DCE = 1,1-dichloroethene | *CH2Cl2 = methylene chloride* | *t12DCE = trans-1,2-dichloroethene*

11DCA = 1,1-dichloroethane | *c12DCE = cis-1,2-dichloroethene* | *CHCl3 = chloroform*

111TCA = 1,1,1-trichloroethane | *CCl4 = carbon tetrachloride* | *TCE = trichloroethene*

112TCA = 1,1,2-trichloroethane | *PCE = tetrachloroethene*

** 11DCE/TCTFA and CCl4/12DCA are co-eluting pairs and are reported in concentrations of 11DCE and CCl4, respectively.*

TARGET LABORATORIES, INC.

CHAIN OF CUSTODY

EAH011L

JOB CODE: LESF

Itemized Sample List

2F1134	SAC1217	Blank							
2A1142	2011576	EXB							
2B1148	SAC1-1213								
1B1572	2E1200								
2C1153	SBC1209								

Type of analysis: FID ___ ECD 8010 ✓ TPH ___ TCD ___ C_1-C_4 ___
Other ___

Type of Sample (circle one): (Vapor), Soil, Water, Product

Relinquished by	Date/Time	Received by	Remarks:
Darrell Richardson	1024 6/2/95	Christie Beebe 6/3/95	

Mode of Shipment: Fed-Ex (#)

Sampler's Name: Darrell Richardson Total No. Samples: ~~11~~ 12

Sampler's Address: 5724 Summer Trees Drive Memphis, TN 38134

Phone #: 901-372-7962 Fax #: 901-372-2454

Special Requirements: Need data by 6/8/95

Purchase Order Number 1048-061

Send report to: Darrell Richardson
(same address as above)

Phone # 372-7962 Fax # 372-2454

WARNING: DO NOT ATTACH STICKERS TO VIALS, USE PERMANENT MARKER

Rev. 11/5/92

APPENDIX B

PRE-FINAL CONSTRUCTION INSPECTION REPORT

EnSafe Environmental and Safety Designs, Inc.

Memphis, TN • Nashville, TN • Raleigh, NC • Pensacola, FL • North Charleston, SC

5724 Summer Trees Dr. • P.O. Box 341315 • Memphis, TN 38184-1315

May 26, 1995

Ms. Beth Brown
Remedial Project Manager
USEPA Region IV
345 Courtland St., NE
Atlanta, GA 30365

Re: Pre-Final Construction Inspection Report

Dear Ms. Brown:

On behalf of the Carrier Corporation, Environmental and Safety Designs, Inc. (EnSafe, Inc.) is pleased to submit the Pre-Final Construction Inspection Report for the Main Plant Area soil vapor extraction (SVE) system located at Carrier Corporation, Collierville, Tennessee, in accordance with Task III — Remedial Action, of the Statement of Work for Remedial Design and Remedial Action.

The report outlines outstanding construction items, actions required to resolve the items, a completion date for the items, and an anticipated date for the Final Inspection.

If you have any questions or comments, please do not hesitate to call me at (901) 372-7962.

Sincerely,

Environmental and Safety Designs, Inc.

By: Darrell Richardson
Environmental Engineer

Enclosure

cc: Mr. Nelson Wong, Carrier
Mr. Carl Krull, Carrier
Ms. Sharon Everett, TDEC

Telephone: 901-372-7962 • Facsimile: 901-372-2454

PRE-FINAL CONSTRUCTION INSPECTION REPORT
MAIN PLANT AREA SOIL VAPOR EXTRACTION SYSTEM

PRE-FINAL INSPECTION

A Pre-Final Construction Inspection was held at the Carrier Air Conditioning Plant in Collierville, Tennessee on February 23, 1995. The objective of the inspection was to determine whether the construction was complete and consistent with the Unilateral Administrative Order (UAO).

Those attending the inspection included:

Mr. Nelson Wong, P.E.	Carrier (Syracuse, NY)
Mr. Carl Krull	Carrier (Collierville, TN)
Ms. Beth Brown	USEPA Region IV
Mr. Chi-Yuan Fan, P.E.	USEPA ORD
Ms. Sharon Everett	TDEC
Mr. Craig Wise	EnSafe
Mr. Darrell Richardson	EnSafe
Mr. Mike Atkeison	G & H Construction

Beginning the morning of February 23, the as-built drawings for the SVE system were reviewed and photographs of the underground piping installation were shown. After review of the drawings and photographs, an inspection tour of the system was conducted. At the time of this inspection, the horizontal lines of the system were not operational due to water which had filled the lines.

CONSTRUCTION COMPLETION PUNCHLISTS

Following completion of the Pre-Final Inspection, EnSafe and US EPA representatives prepared a construction completeness punch list for remaining construction items. The following items were noted:

- Addition of a 2-inch ball valve opened to atmosphere to reduce the load on the blower at startup. The best location was determined to be at an existing elbow just upstream of the blower (adjacent to the vacuum relief valve).
- Addition of metal identification tags attached to all gauges, and valves.
- A checklist was provided by EPA during the Pre-Final Inspection. This completed checklist is included as Attachment A to this report. The checklist lists all treatment equipment and specifications of the equipment and will be used during the Final Inspection to verify operational capability of the equipment.

In addition to the above items suggested during the inspection, an internal list of items was generated which include items yet to be installed or corrected, and additional items. These items are listed below:

- Temperature indicator at discharge stack was not installed.
- 2, 1-inch gate valves located on horizontal lines H1 and H2.
- Air leakage around the heater flange connections.
- Water in the manifold lines. This occurred during construction of the field piping.
- Addition of a second temperature indicator downstream of the heater for monitoring air temperature.
- Additional piping at the moisture separator drain valve.

CONSTRUCTION COMPLETION

As of the date of this report, all of the above outstanding items have been resolved with the exception of removing all water from the underground piping system where the horizontal lines (H1 and H2) are located.

As of May 1, 1995, approximately 1,600 gallons of water have been removed from the underground lines (H1, H2, deep manifold, and shallow manifold). The majority of this water was removed from line H2. Discussions with the Carrier Plant Engineer indicated that this water evolved when parts of the plant were repaved, thus trapping water beneath the pavement and continues to receive water from unpaved parts of the facility. Line H2 is installed in the main trench which contains the shallow well manifold line as well as the deep well manifold. Although H2 only runs from the western part of the concrete pad, east to the breezeway, the trench continues west to SVE 2E thus the H2 trench is exposed to more area than the H1 trench which stops at the breezeway.

During pumping of water from the horizontal lines, there was no indication that the water removal rate was dropping, this was evidenced by recharge of horizontal line H2 in less than 8 hours. After complete removal of water from the H2 trench, the line has run continuously for up to 8 hours without filling up the moisture separator. Line H1 has run continuously after removal of water from the trench. Horizontal lines H1 and H2 are functional, and will meet the criteria for soils remediation.

The design intent of lines H1 and H2 were to provide lateral flow between the two lines, also H1 was installed as close to the building as possible to remediate the shallowest soils near and immediately under the MPA building. The collection of water in H2 presents operational obstacles, which can be remedied, when using it with H1 as an air recharge source, but does not

prevent H1 from remediating the shallow soils. An amendment to the Operation & Maintenance manual for the system is currently being reviewed which will address the future operating mode of the horizontal gallery. Conceptually, the gallery will be operated after initial operation of the vertical extraction well system, and then during relatively hot dry weather to alleviate water collection in the gallery.

The vertical SVE wells are functional and will meet the criteria for soils cleanup, see the checklist for data gathered on the vertical extraction wells. There has been no collection of water in the vertical well manifolds.

POST-CONSTRUCTION INSPECTION CHECKLIST

All equipment and instrumentation has been inspected and operationally tested. The results are indicated on the checklist (Attachment A). Functional testing of the shallow and deep wells has also been performed to gather preliminary system performance data for the checklist. Functional testing consisted of running the system at three different operating modes (vacuums). To illustrate how deep and shallow well flowrates may increase with time, the SVE system was allowed to run continuously for 3 days and flowrates once again recorded at the same operating modes as previously described. Analytical data for the 3 day test was not collected due to time constraints with the laboratory.

In addition, a sample of the water being pulled from the horizontal lines was taken and analyzed by USEPA Method 8010. Analyses indicate TCE at a concentration of 28,200 ug/L as well as some other constituents being detected. Laboratory analytical results are included as Attachment B to this report. This sample may not be representative of all the water which has been extracted from the subsurface lines. All water that is extracted from the subsurface lines is treated at the North Remediation Site air stripper.

FINAL INSPECTION

During this inspection, confirmation will be made that all outstanding items have been resolved. Also, the system will be operationally tested at this time.

The Final Inspection is tentatively scheduled for June 1, 1995.

ATTACHMENT A

CHECKLIST

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: May 4, 19, & 22, 1995 Inspector(s) Darrell Richardson

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attach checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status
		EQUIPMENT			
05/04	900	Emission Stack			
05/04	900	Temperature Indicator	TI-1	range:0-220 deg F	**see "Flowrate Data for Checklist"**
05/04	905	Regenerative Blower		Rotron DR1223BH72	operational
05/04	905	Electric Motor		20-hp,3530 rpm (60 Hz)	operational
05/04		Control System		auto/manual override	ok
05/04		Vacuum Relief Valve		auto-vac break at 170 in. H2O	system not tested at 170 in. water
05/04	905	Air Inlet Valve	V-DIL	2-in ball valve	operational
05/04	910	Vacuum Gauge	PI-5	range:0-160 in H2O	**see "Flowrate Data for Checklist"**
05/04	910	Particulate Filter		Rotron 516465	operational
05/04	915	Vacuum Gauge	PI-4	range:0-160 in H2O	**see "Flowrate Data for Checklist"**
05/19		Sample Port	SP-AC	after both carbon units	**see "Analytical Data for Checklist"**
05/04	920	Activated Carbon Unit #2		capacity: 2,000 lb 4x10	operational
05/04	920	Vacuum Gauge	PI-3	range:0-160 in H2O	**see "Flowrate Data for Checklist"**
05/19		Sample Port	SP-AC1	after carbon unit #1	**see "Analytical Data for Checklist"**
05/04	920	Activated Carbon Unit #1		capacity: 2,000 lb 4x10	operational
05/04	925	Vacuum Gauge	PI-2	range:0-160 in H2O	**see "Flowrate Data for Checklist"**
05/04	925	Temperature Indicator	TI-2	range:0-220 deg F	**see "Flowrate Data for Checklist"**
05/04	935	Electric Heater		4 KW, max T=100 deg F	operational
05/04	945	Controls		max:100 deg F, therm:95 deg F	thermostat set at 95 deg F
05/04	955	Flow Meter	FI-1	range:10-100 cfm	**see "Flowrate Data for Checklist"**

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: May 4, 19, & 22, 1995 Inspector(s) Darrell Richardson

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attach checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status
05/04	1000	Vacuum Gauge	PI-1	range:0-160 in H2O	**see "Flowrate Data for Checklist"**
05/19		Sample Port	SP-BC	before carbon units	**see "Analytical Data for Checklist"**
05/04	1000	Moisture Separator		Rotron MS500, 40-gal cap.	operational
05/04	1015	Water Level Indicator		local:Flotec, pnl:high level alarm	operational
05/04	1020	Drain Valve	V-MSD		operational
		MANIFOLD LINES			
05/04	855	Shallow Manifold	V-SH	4-in ball valve	operational
05/19		Vacuum		quick conn., range:0-40 in H2O	**see "Flowrate Data for Checklist"**
05/04	855	Deep Manifold	V-DP	4-in ball valve	operational
05/19		Vacuum		quick conn., range:0-40 in H2O	**see "Flowrate Data for Checklist"**
		HORIZONTAL LINES			
		Horizontal 1			
05/04	900	Valve	V-H1A	4-in ball valve	operational
05/04	900	Valve	V-H1B	2-in gate valve	operational
05/04	900	Vacuum		quick conn., range:0-40 in H2O	100 in. H2O
		Sample Port	SP-H1		no data, water in line
05/04	900	Flow Measurement	FI-1		40-45 cfm
		Horizontal 2			
05/04	900	Valve	V-H2A	4-in ball valve	operational
05/04	900	Valve	V-H2B	2-in gate valve	operational
05/04	900	Vacuum		quick conn., range:0-40 in H2O	100 in. H2O
		Sample Port	SP-H2		no data, water in line
05/04	900	Flow Measurement	FI-1		40-45 cfm
		SHALLOW WELLS			

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: May 4, 19, & 22, 1995 Inspector(s) Darrell Richardson

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attach checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status
		Shallow Extraction Well	SVE-2F		
05/04	905	Valve	V-2F	2-in gate valve	operational
05/19		Sample Port	SP-2F		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2A		
05/04	910	Valve	V-2A	2-in gate valve	operational
05/19		Sample Port	SP-2A		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2B		
05/04	915	Valve	V-2B	2-in gate valve	operational
05/19		Sample Port	SP-2B		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2C		
05/04	920	Valve	V-2C	2-in gate valve	operational
05/19		Sample Port	SP-2C		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2D		
05/04	925	Valve	V-2D	2-in gate valve	operational
05/19		Sample Port	SP-2D		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		Shallow Extraction Well	SVE-2E		
05/04	930	Valve	V-2E	2-in gate valve	operational
05/19		Sample Port	SP-2E		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**

DEEP WELL

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: May 4, 19, & 22, 1995 Inspector(s) Darrell Richardson

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attach checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status
		Deep Extraction Well	SVE-1B		
05/04	940	Valve	V-1B	2-in gate valve	operational
05/19		Sample Port	SP-1B		**see "Analytical Data for Checklist"**
05/19&05/22		Flow Measurement		anemometer reading	**see "Flowrate Data for Checklist"**
		MONITORING WELLS			
		Monitoring Probe	MP-7B	Deep monitoring probe	
05/19		Pressure monitoring		quick conn., range:0-40 in H2O	being tested on 5/30
		Monitoring Probe	MP-4B	Shallow monitoring probe	
05/19		Pressure monitoring		quick conn., range:0-40 in H2O	being tested on 5/30
		Monitoring Probe	MP-6B	Shallow monitoring probe	
05/19		Pressure monitoring		quick conn., range:0-40 in H2O	being tested on 5/30
		Monitoring Probe	MP-8B	Shallow monitoring probe	
05/19		Pressure monitoring		quick conn., range:0-40 in H2O	0, holding water
		Monitoring Probe	MP-3B	Deep monitoring probe	
05/19		Pressure monitoring		quick conn., range:0-40 in H2O	being tested on 5/30
		CONTROL PANEL			
05/04		Control Panel	CP	NEMA 4 panel	operational
05/04		SVE Blower		Hand/Off/Auto Operation	operational
05/04		Moisture Separator		High Level Alarm	operational
05/04		Timer		24-hr operational	operational

SUGGESTED CHECKLIST FOR CONDUCTING SVE SYSTEM POST-CONSTRUCTION INSPECTION
CARRIER COLLIERVILLE SITE - MAIN PLANT AREA

Date: May 4, 19, & 22, 1995 Inspector(s) Darrell Richardson

This checklist contains every piece of equipment or instrument in order, starting at the emission stack toward the SVE wells. Equipment such as vacuum gauges, sample ports, wellhead flowrates, etc. which require testing at different operating modes are included as attach checklist. Status of other equipment is listed as either operational/not operational.

Date	Time	Inspected Item	I.D.	Specifications	Status

Flowrate Data for Checklist

Carrier MPA SVE

Operating Modes: 1=only shallow wells open, 2=only deep well open, 3=shallow and deep wells open

Operating Mode #	Well I.D.	Date	Time of Day	Elapsed Time (min)	Wellhead Flowrate (acfm)	Wellhead Flowrate (scfm)	Flowrates taken at the conditions shown below: FI-1 (cfm)	PI-1 (in H2O)	PI-2 (in H2O)	PI-3 (in H2O)	PI-4 (in H2O)	PI-5 (in H2O)	Manif. (in H2O)	TI-1 (deg F)	TI-2 (deg F)
1	2A	05/19/95	1055	115	**2.5**	**2.6**	0.0	90	84	91	86	90	85	110	64
1	2B	05/19/95	1100	120	**3.0**	**3.1**	0.0	90	84	91	86	90	85	110	64
1	2C	05/19/95	1106	126	**2.9**	**3.0**	0.0	90	84	91	86	90	85	110	64
1	2D	05/19/95	1112	132	**3.0**	**3.1**	0.0	90	84	91	86	90	85	110	64
1	2E	05/19/95	1117	137	**3.1**	**3.2**	0.0	90	84	91	86	90	85	110	64
1	2F	05/19/95	1048	108	**3.5**	**3.6**	0.0	90	84	91	86	90	85	110	64
2	1B	05/19/95	1136	156	**28.5**	**29.5**	35.0	90	86	94	90	94	86	110	64
1	2A	05/19/95	1159	179	**3.5**	**3.7**	0.0	110	104	111	106	111	105	120	65
1	2B	05/19/95	1204	184	**3.6**	**3.8**	0.0	110	104	111	106	111	105	120	65
1	2C	05/19/95	1209	189	**3.3**	**3.4**	0.0	110	104	111	106	111	105	120	65
1	2D	05/19/95	1214	194	**4.0**	**4.2**	0.0	110	104	111	106	111	105	120	65
1	2E	05/19/95	1218	198	**3.8**	**4.0**	0.0	110	104	111	106	111	105	120	65
1	2F	05/19/95	1154	174	**3.7**	**3.9**	0.0	110	104	111	106	111	105	120	65
2	1B	05/19/95	1232	212	**32.0**	**33.4**	40.0	110	105	112	108	113	105	120	65
1	2A	05/19/95	1350	290	**3.4**	**3.6**	10.0	120	114	120	116	121	115	160	65
1	2B	05/19/95	1356	296	**3.3**	**3.5**	10.0	120	114	120	116	121	115	160	65
1	2C	05/19/95	1400	300	**3.4**	**3.6**	10.0	120	114	120	116	121	115	160	65
1	2D	05/19/95	1404	304	**4.2**	**4.4**	10.0	120	114	120	116	121	115	160	65
1	2E	05/19/95	1408	308	**3.9**	**4.1**	10.0	120	114	120	116	121	115	160	65
1	2F	05/19/95	1347	287	**4.0**	**4.2**	10.0	120	114	120	116	121	115	160	65
2	1B	05/19/95	1419	319	**32.3**	**33.9**	40.0	120	116	122	118	123	116	160	65
				(days)											
1	2A	05/22/95	1135	3	**4.0**	**4.1**	0.0	90	84	91	86	90	85	120	64
1	2B	05/22/95	1137	3	**3.8**	**3.9**	0.0	90	84	91	86	90	85	120	64
1	2C	05/22/95	1139	3	**4.0**	**4.1**	0.0	90	84	91	86	90	85	120	64
1	2D	05/22/95	1141	3	**4.0**	**4.1**	0.0	90	84	91	86	90	85	120	64
1	2E	05/22/95	1143	3	**3.8**	**3.9**	0.0	90	84	91	86	90	85	120	64
1	2F	05/22/95	1133	3	**4.2**	**4.3**	0.0	90	84	91	86	90	85	120	64
2	1B	05/22/95	1200	3	**39.0**	**40.4**	40.0	90	86	94	90	94	85	115	64
1	2A	05/22/95	1258	3	**6.0**	**6.3**	0.0	110	106	112	108	112	105	140	65
1	2B	05/22/95	1300	3	**6.5**	**6.8**	0.0	110	106	112	108	112	105	140	65
1	2C	05/22/95	1306	3	**4.5**	**4.7**	0.0	110	106	112	108	112	105	140	65
1	2D	05/22/95	1308	3	**4.3**	**4.5**	0.0	110	106	112	108	112	105	140	65
1	2E	05/22/95	1311	3	**6.0**	**6.3**	0.0	110	106	112	108	112	105	140	65
1	2F	05/22/95	1255	3	**5.5**	**5.7**	0.0	110	106	112	108	112	105	140	65
2	1B	05/22/95	1330	3	**40.0**	**41.7**	40-45	110	105	112	108	113	105	130	65
1	2A	05/22/95	1339	3	**8.0**	**8.4**	10-15	120	115	120	116	122	115	165	66
1	2B	05/22/95	1342	3	**7.0**	**7.4**	10-15	120	115	120	116	122	115	165	66
1	2C	05/22/95	1346	3	**8.0**	**8.4**	10-15	120	115	120	116	122	115	165	66
1	2D	05/22/95	1350	3	**8.0**	**8.4**	10-15	120	115	120	116	122	115	165	66
1	2E	05/22/95	1355	3	**8.5**	**8.9**	10-15	120	115	120	116	122	115	165	66
1	2F	05/22/95	1335	3	**7.0**	**7.4**	10-15	120	115	120	116	122	115	165	66
2	1B	05/22/95	1410	3	**42.0**	**44.1**	45-50	120	116	122	118	123	115	162	66

Analytical Data for Checklist

Carrier MPA SVE

Operating Modes: 1=only shallow wells open, 2=only deep well open, 3=both shallow and deep open
(data taken at the operating mode # as shown on "flowrate data for checklist", except 5/3/95 data:blower running @ 100 in H2O)

Operating Mode #	Manifold/ Well I.D.	Date	Time of Day	Elapsed Time (min)	Sample I.D.	Analyte Concentrations via GC/ECD (ug/l unless otherwise noted) 11DCE	CH2C12	t12DCE	11DCA	c12DCE	CHC13	111TCA	CC14	TCE	TCE* (ppm v/v)	112TCA	PCE
	shallow&deep/before carbon#	05/03/95	1255	55	SDBC1255	12	<1.0	15	<1.0	350	3.1	<1.0	<1.0	**25,800**	**4,791**	<1.0	7.6
	shallow&deep/after carbon#2	05/03/95	1330	90	SDAC1330	<1.0	<1.0	<1.0	<1.0	1.9	<1.0	<1.0	<1.0	**15**	**3**	<1.0	<1.0
	shallow/before carbon#1	05/03/95	1305	95	SBC1305	10	<1.0	10	<1.0	1,150	<1.0	<1.0	<1.0	**12,000**	**2,229**	<1.0	4.4
	deep/before carbon#1	05/03/95	1259	59	DBC1259	8.4	<1.0	11	<1.0	199	2.3	<1.0	<1.0	**16,600**	**3,083**	<1.0	5.8
1	2A	05/19/95	1056	116	2A1056	28	<1.0	68	<1.0	1,100	1.9	<1.0	<1.0	**10,100**	**1,876**	<1.0	15
1	2B	05/19/95	1102	122	2B1102	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**24**	**4**	<1.0	<1.0
1	2C	05/19/95	1108	128	2C1108	53	<1.0	43	<1.0	4,040	6.5	<1.0	<1.0	**13,900**	**2,581**	<1.0	24
1	2D	05/19/95	1112	132	2D1112	53	<1.0	45	<1.0	4,690	3.8	<1.0	<1.0	**8,770**	**1,629**	<1.0	13
1	2E	05/19/95	1118	138	2E1118	12	<1.0	7	1.1	948	1.1	<1.0	<1.0	**3,210**	**596**	<1.0	3.5
1	2F	05/19/95	1050	110	2F1050	34	<1.0	37	<1.0	2,770	1.2	<1.0	<1.0	**9,390**	**1,744**	<1.0	9.8
2	1B	05/19/95	1137	157	1B1137	11	<1.0	10	<1.0	228	2.9	<1.0	<1.0	**4,770**	**886**	<1.0	1.2
1	shallow/before carbon#1	05/19/95	1125	145	SBC1125	25	<1.0	26	<1.0	1,730	2.1	<1.0	<1.0	**9,990**	**1,855**	<1.0	11
2	deep/before carbon#1	05/19/95	1142	162	DBC1142	18	<1.0	20	<1.0	404	4.9	<1.0	<1.0	**8,900**	**1,653**	<1.0	12
1	2A	05/19/95	1200	180	2A1200	32	<1.0	63	<1.0	1,100	1.9	<1.0	<1.0	**10,000**	**1,857**	<1.0	11
1	2B	05/19/95	1206	186	2B1206	34	<1.0	42	<1.0	1,590	2.6	<1.0	<1.0	**12,900**	**2,396**	<1.0	8
1	2C	05/19/95	1210	190	2C1210	44	<1.0	29	<1.0	3,290	4.8	<1.0	<1.0	**17,800**	**3,306**	<1.0	1.7
1	2D	05/19/95	1215	195	2D1215	31	<1.0	26	<1.0	3,120	1.9	<1.0	<1.0	**6,780**	**1,259**	<1.0	6.4
1	2E	05/19/95	1220	200	2E1220	11	<1.0	6	<1.0	867	1.1	<1.0	<1.0	**3,470**	**644**	<1.0	9.2
1	2F	05/19/95	1156	176	2F1156	20	<1.0	20	<1.0	1,600	<1.0	<1.0	<1.0	**6,400**	**1,189**	<1.0	12
1	1B	05/19/95	1233	213	1B1233	18	<1.0	20	<1.0	418	5	<1.0	<1.0	**13,200**	**2,451**	<1.0	12
1	shallow/before carbon#1	05/19/95	1224	204	SBC1224	20	<1.0	20	<1.0	1,380	1.7	<1.0	<1.0	**6,620**	**1,229**	<1.0	9.2
2	deep/before carbon#1	05/19/95	1236	216	DBC1236	14	<1.0	14	1.5	305	3.8	<1.0	<1.0	**9,980**	**1,853**	<1.0	9.6
1	2A	05/19/95	1352	292	2A1352	49	<1.0	110	<1.0	1,860	3.7	1.8	<1.0	**18,400**	**3,417**	<1.0	23
1	2B	05/19/95	1358	298	2B1358	49	<1.0	57	<1.0	2,350	4.3	1.2	<1.0	**21,200**	**3,937**	<1.0	28
1	2C	05/19/95	1401	301	2C1401	52	<1.0	36	<1.0	3,580	5.9	<1.0	<1.0	**14,300**	**2,656**	<1.0	19
1	2D	05/19/95	1405	305	2D1405	35	<1.0	30	<1.0	3,630	2	<1.0	<1.0	**8,917**	**1,656**	<1.0	11
1	2E	05/19/95	1409	309	2E1409	7.4	<1.0	3	<1.0	580	<1.0	<1.0	<1.0	**1,610**	**299**	<1.0	1.4
1	2F	05/19/95	1348	288	2F1348	18	<1.0	17	<1.0	1,400	<1.0	<1.0	<1.0	**3,510**	**652**	<1.0	1.3
2	1B	05/19/95	1420	320	1B1420	21	<1.0	22	<1.0	456	5.6	<1.0	<1.0	**13,500**	**2,507**	<1.0	15
1	shallow/before carbon#1	05/19/95	1413	313	SBC1413	32	<1.0	35	<1.0	2,140	2.8	<1.0	<1.0	**13,200**	**2,451**	<1.0	14
2	deep/before carbon#1	05/19/95	1423	323	DBC1423	17	<1.0	17	<1.0	352	4.4	<1.0	<1.0	**11,800**	**2,191**	<1.0	10
1	shallow/after carbon #1	05/19/95	1415	315	SAC11415	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**16**	**3**	<1.0	<1.0
3	shallow&deep/before carbon#	05/19/95	1430	330	SDBC1430	16	<1.0	19	<1.0	533	3.4	<1.0	<1.0	**10,500**	**1,950**	<1.0	9.3
3	shallow&deep/after carbon #1	05/19/95	1435	335	SDAC11435	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**33**	**6**	<1.0	<1.0
3	shallow&deep/after carbon#2	05/19/95	1440	340	SDAC1440	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**27**	**5**	<1.0	<1.0

*** TCE (ppm v/v) reported at 25 deg C and 1 atmosphere.**

Sample Designation:

Line Location:		Process Location:		Time:	
2a..2f	shallow wells	BC	before carbon	i.e. 1430	2:30 pm
1b	deep well	AC1	after carbon #1		
S	shallow manifold	AC	after all carbon		
D	deep manifold				

SDAC11435 = shallow & deep manifold sample combined, taken after carbon unit #1 at 2:35 p.m.

Monitoring Probe Data for Checklist

Carrier MPA SVE

Operating Modes: 0=system off (background), 1=shallow wells only, 2=deep well only, 3=shallow wells only (SVE2B closed)
4=shallow wells only (SVE2B and SVE2C closed)

perating Mode #	Monitoring Probe I.D.	Date	Time of Day	Elapsed Time (min)	Vacuum (in H2O)	Pressures taken at conditions shown below: PI-1 (in H2O)	PI-2 (in H2O)	PI-3 (in H2O)	PI-4 (in H2O)	PI-5 (in H2O)
0	4	5/30/95	900	0	0	0	0	0	0	0
0	6	5/30/95	905	0	1.2	0	0	0	0	0
0	7	5/30/95	908	0	0.9	0	0	0	0	0
0	8	5/30/95	909	well holding water		0	0	0	0	0
0	3	5/30/95	915	0	0.8	0	0	0	0	0
1	4	5/30/95	1016	76	0	90	84	91	86	90
1	6	5/30/95	1020	80	4.2	90	84	91	86	90
1	7	5/30/95	1024	84	1.2	90	84	91	86	90
1	8	5/30/95	1025	well holding water		90	84	91	86	90
1	3	5/30/95	1030	90	0.9	90	84	91	86	90
1	4	5/30/95	1056	116	0	110	105	112	108	113
1	6	5/30/95	1100	120	5.1	110	105	112	108	113
1	7	5/30/95	1054	114	1.1	110	105	112	108	113
1	8	5/30/95	1055	well holding water		110	105	112	108	113
1	3	5/30/95	1105	125	0.9	110	105	112	108	113
1	4	5/30/95	1125	145	0	120	114	120	116	121
1	6	5/30/95	1140	160	5.4	120	114	120	116	121
1	7	5/30/95	1120	140	1.1	120	114	120	116	121
1	8	5/30/95	1121	well holding water		120	114	120	116	121
1	3	5/30/95	1145	165	0.9	120	114	120	116	121
2	4	5/30/95	1215	195	0	90	84	91	86	90
2	6	5/30/95	1225	205	2.3	90	84	91	86	90
2	7	5/30/95	1200	180	2.7	90	84	91	86	90
2	8	5/30/95	1202	well holding water		90	84	91	86	90
2	3	5/30/95	1240	220	2	90	84	91	86	90
2	4	5/30/95	1255	235	0	110	105	112	108	113
2	6	5/30/95	1300	240	2	110	105	112	108	113
2	7	5/30/95	1250	230	3.1	110	105	112	108	113
2	8	5/30/95	1252	well holding water		110	105	112	108	113
2	3	5/30/95	1315	255	2.2	110	105	112	108	113
2	4	5/30/95	1340	280	0	120	114	120	116	121
2	6	5/30/95	1350	290	2.5	120	114	120	116	121
2	7	5/30/95	1330	270	4.5	120	114	120	116	121
2	8	5/30/95	1331	well holding water		120	114	120	116	121
2	3	5/30/95	1400	300	2.8	120	114	120	116	121
3	6	5/30/95	1410	10	4.6	110	105	112	108	113
4	6	5/30/95	1420	20	4.5	110	105	112	108	113

Optg. modes 3 & 4 performed due to absence of using MP-8. SVE2B and SVE2C are located approximately 20 feet on each s

Monitoring probes 4, 6, and 8 are shallow probes. Monitoring probes 3 and 7 are deep.

Mass Removal Rates for Checklist - TCE

Carrier MPA SVE

Operating Mode #	Manifold/ Well I.D.	Sample I.D.	Date	Elapsed Time (min)	Flowrate (cfm)	TCE Concentration (ug/l)	Removal (lb/day)
1	2A	2A1056	05/19/95	116	2.5	10,100	2.266
1	2B	2B1102	05/19/95	122	3.0	24	0.006
1	2C	2C1108	05/19/95	128	2.9	13,900	3.618
1	2D	2D1112	05/19/95	132	3.0	8,770	2.362
1	2E	2E1118	05/19/95	138	3.1	3,210	0.893
1	2F	2F1050	05/19/95	110	3.5	9,390	2.950
1	1B	1B1137	05/19/95	157	28.5	4,770	12.203
1	shallow manifold	SBC1125	05/19/95	145	18.0	9,990	16.141
1	deep manifold	DBC1142	05/19/95	162	35.0	8,900	27.961
2	2A	2A1200	05/19/95	180	3.5	10,000	3.142
2	2B	2B1206	05/19/95	186	3.6	12,900	4.169
2	2C	2C1210	05/19/95	190	3.3	17,800	5.273
2	2D	2D1215	05/19/95	195	4.0	6,780	2.434
2	2E	2E1220	05/19/95	200	3.8	3,470	1.184
2	2F	2F1156	05/19/95	176	3.7	6,400	2.126
2	1B	1B1233	05/19/95	213	32.0	13,200	37.916
2	shallow manifold	SBC1224	05/19/95	204		6,620	0.000
2	deep manifold	DBC1236	05/19/95	216	40.0	9,980	35.833
3	2A	2A1352	05/19/95	292	3.4	18,400	5.616
3	2B	2B1358	05/19/95	298	3.3	21,200	6.280
3	2C	2C1401	05/19/95	301	3.4	14,300	4.364
3	2D	2D1405	05/19/95	305	4.2	8,917	3.362
3	2E	2E1409	05/19/95	309	3.9	1,610	0.564
3	2F	2F1348	05/19/95	288	4.0	3,510	1.260
3	1B	1B1420	05/19/95	320	32.3	13,500	39.141
3	shallow manifold	SBC1413	05/19/95	313	10.0	13,200	11.849
3	deep manifold	DBC1423	05/19/95	323	40.0	11,800	42.368

ATTACHMENT B

MOISTURE SEPARATOR ANALYTICAL RESULTS

ENVIRONMENTAL TESTING & CONSULTING, INC.

2924 Walnut Grove Road - Memphis, TN 38111 - (901)327-2750

ORGANIC ANALYSIS DATA SHEET

Client Name **Ensafe**

P.O. Box 341315
Memphis, TN 38184

Project # 1048-047
FID #

Site ID Carrier
Collierville, TN

Date Arrived 05/22/95
ETC Order Number 9505582

ETC Lab ID 9505582-01
Sample ID: MSEP

Matrix :AQUEOUS
Sample Date :05/22/95

TEST	RESULT	UNITS	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED	BY	METHOD
Volatile Organics							8010
					05/23/95	DC	
Bromobenzene	ND	ug/L	0.500				
Bromodichloromethane	ND	ug/L	0.500				
Bromoform	ND	ug/L	0.500				
Bromomethane	ND	ug/L	0.500				
Carbon tetrachloride	ND	ug/L	0.500				
Chlorobenzene	ND	ug/L	0.500				
Chloroethane	ND	ug/L	0.500				
2-Chloroethyl vinyl ether	ND	ug/L	0.500				
Chloroform	5.47	ug/L	0.500				
Chloromethane	ND	ug/L	0.500				
Dibromochloromethane	ND	ug/L	0.500				
Dibromomethane	ND	ug/L	0.500				
1,2-Dichlorobenzene	ND	ug/L	0.500				
1,3-Dichlorobenzene	ND	ug/L	0.500				
1,4-Dichlorobenzene	ND	ug/L	0.500				
Dichlorodifluoromethane	ND	ug/L	0.500				
1,1-Dichloroethane	ND	ug/L	0.500				
1,2-Dichloroethane	ND	ug/L	0.500				
1,1-Dichloroethene	9.18	ug/L	0.500				
trans-1,2-Dichloroethene	16.7	ug/L	0.500				
Dichloromethane	ND	ug/L	5.00				
1,2-Dichloropropane	ND	ug/L	0.500				
cis-1,3-Dichloropropene	ND	ug/L	0.500				
trans-1,3-Dichloropropene	ND	ug/L	0.500				
1,1,2,2-Tetrachloroethane	ND	ug/L	0.500				
1,1,1,2-Tetrachloroethane	ND	ug/L	0.500				
Tetrachloroethene	5.69	ug/L	0.500				
1,1,1-Trichloroethane	ND	ug/L	0.500				
1,1,2-Trichloroethane	5.17	ug/L	0.500				
Trichloroethene	28,200	ug/L	0.500				
Trichlorofluoromethane	ND	ug/L	0.500				
1,2,3-Trichloropropane	ND	ug/L	0.500				
Vinyl Chloride	17.1	ug/L	0.500				

Surrogate Standard	% Recovery	QC Limits	
S1-DFB	123	50	150
S2-DCB	106	50	150

ND - Not Detected

LABORATORY MANAGER

ATTACHMENT C

SITE CONSTRUCTION PHOTOGRAPHS

APPENDIX C

SITE CONSTRUCTION PHOTOGRAPHS

Initial Demolition

Initial Demolition — Trenching

Horizontal Line — H1

Main Trench Line

Main Header Line — Connection to Vaults

Connection to Vaults

SVE Well Vaults — Shallow Well Header Line

SVE Well Vaults — Deep/Shallow Lines

Shallow/Deep Header Lines

Horizontal Line — H1

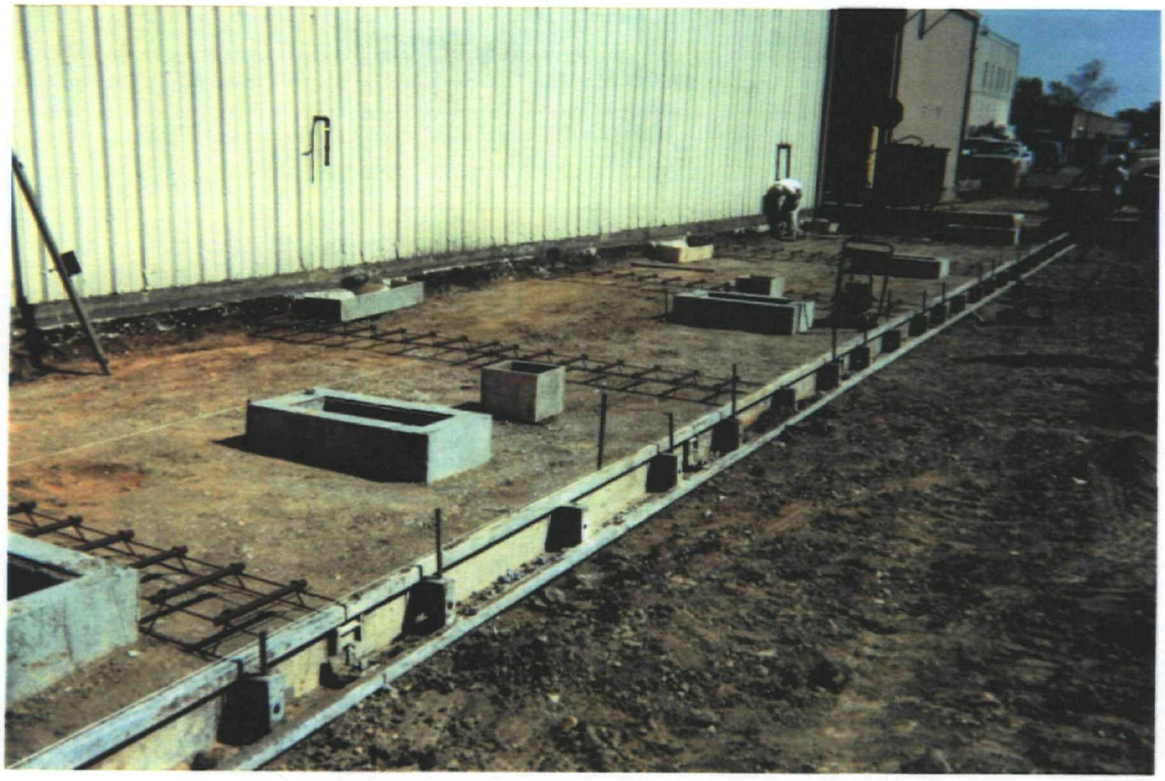
SVE Well Vault — Inside

SVE Well Vaults

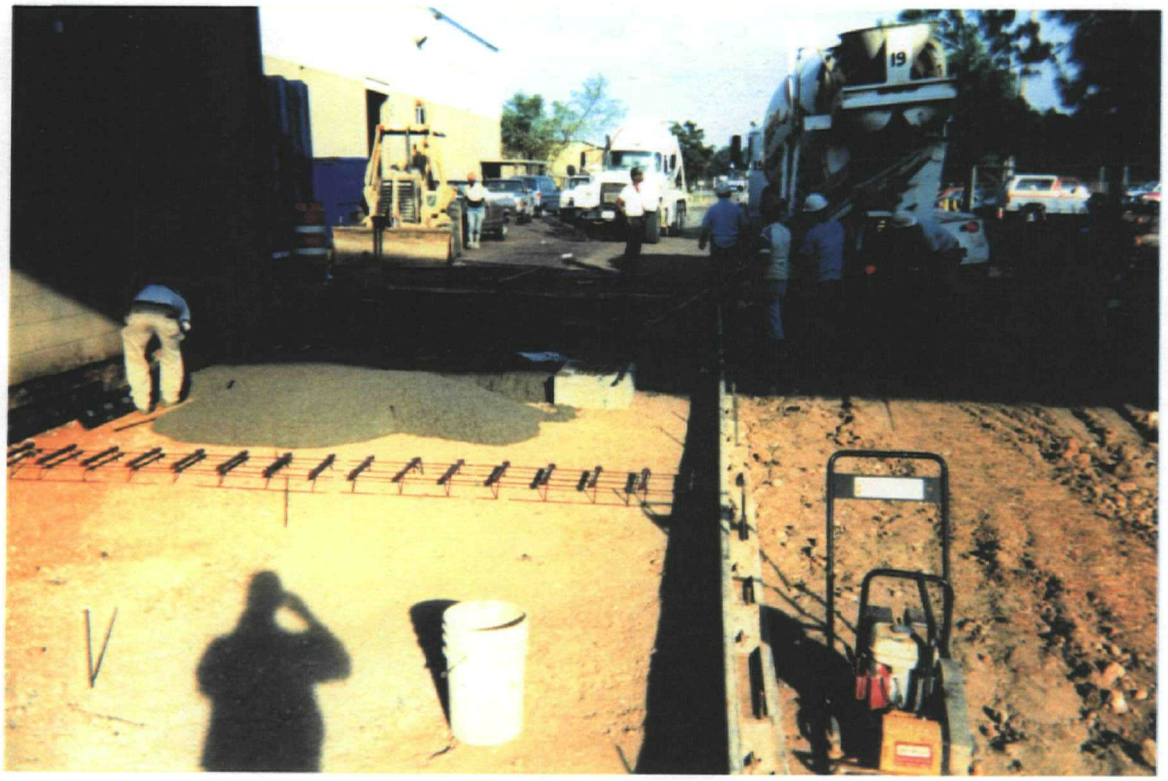
Final Grading

Final Grading

Concrete Reinforcements



Concrete Reinforcements



Concrete — First Pour

Concrete — First Pour

Concrete — First Pour Completed

Concrete — First Pour Completed

EnSafe Environmental and Safety Designs, Inc.

Memphis, TN • Nashville, TN • Raleigh, NC • Pensacola, FL • North Charleston, SC

5724 Summer Trees Dr. • P.O. Box 341315 • Memphis, TN 38184-1315

June 13, 1995

Ms. Beth Brown
Remedial Project Manager
USEPA Region IV
345 Courtland St., NE
Atlanta, GA 30365

Re: Final Construction Inspection Report

Dear Ms. Brown:

On behalf of the Carrier Corporation, Environmental and Safety Designs, Inc. (EnSafe, Inc.) is pleased to submit the Final Construction Inspection Report for the Main Plant Area (MPA) soil vapor extraction (SVE) system located at Carrier Corporation, Collierville, Tennessee, in accordance with Task III — Remedial Action, of the Statement of Work for Remedial Design and Remedial Action.

Also included as an attachment to this report is the Pre-Final Construction Inspection Report which includes a copy of the completed checklist provided by Mr. Evan Fan during the Pre-Final Inspection.

If you have any questions or comments, please do not hesitate to call me at (901) 372-7962.

Sincerely,

Environmental and Safety Designs, Inc.

By: Darrell Richardson
Environmental Engineer

Enclosure

cc: Mr. Nelson Wong, Carrier
Mr. Carl Krull, Carrier
Ms. Sharon Everett, TDEC
file

Telephone: 901-372-7962 • Facsimile: 901-372-2454